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EXAMINER	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/061,492
Filing Date: January 31, 2002
Appellant(s): BUSWELL ET AL.

Paul Mitchell
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 1/5/05.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

(9) Prior Art of Record

4,746,935	ALLEN	5-1988
6,271,102	BROUILLETTE et al.	8-2001
5,658,471	MURTHY et al.	8-1997
6,238,269	POLLARD et al.	5-2001

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claims 43 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,746,935 to Allen in view of U.S. Patent 6,271,102 to Brouillette et al.

Allen teaches a method for forming an ink-jet feed slot in a silicon semiconductor substrate having first and second opposing surfaces comprising: forming a slot through the substrate using a cutting tool having an axis of rotation that is not perpendicular to the first surface (diamond saw blade).

See Column 3, Lines 45-48 of Allen. The slot of Allen passes through the substrate and is defined at least in part by first and second sidewalls and first and second endwalls extending therebetween.

Allen does not teach forming the slot by making a cut into a first surface and removing material from the second surface to form the slot.

Referring to Figures 4A-4C and 7A-7C, Brouillette teaches a method of forming a slot in a silicon semiconductor substrate having first and second opposing surfaces comprising: making a cut into a first surface of a semiconductor substrate using a circular saw blade, and removing material from a second surface of the substrate to form in combination with the cut, a slot that passes entirely through the substrate. See (Col. 5, Lines 52-67 and Col. 6, Lines 1-30).

It would have been obvious to one of ordinary skill in the art at the time of invention to form the fluid handling slot of Allen using the two sided slot forming technique described by Brouillette.

One of ordinary skill in the art would have been motivated at the time of invention to form the fluid handling slot of Allen using the two sided technique described by Brouillette in order to improve quality of the cut, reduce substrate cracking, and provide a clean and strong edges by using entrance cuts instead of exit cuts (Col. 6, Lines 14-30).

Since Allen teaches a slot formed with a saw blade (a structure that inherently has sidewalls and endwalls) and Brouillette likewise teaches a slot formed with a saw blade (See Figure 1 of Brouillete), it is inherent that a first portion of the endwalls is formed by the first cut (said making) and a second portion of the endwalls is formed by the second cut (said removing). Further, an ink-jet feed slot has straight (vertical) endwalls that meet at an angle greater than ninety degrees relative to the substrate. The limitation of the angle of the endwalls as defined by appellant reads on a simple vertical slot.

Regarding Claim 47, Official Notice is taken of the fact that it is old and well known in the art of cutting with a circular saw to make multiple passes with a saw blade to increasing depth in order to prevent cracking of the substrate. It would have been obvious to one of ordinary skill in the art at the time of invention to make multiple passes with a saw blade to increasing depth in order to prevent cracking of the substrate in the well known manner. Further, the limitation of making multiple cuts reads on any cut

made with a circular saw blade, since the blade has multiple cutting surfaces that impact the substrate as the blade is rotated.

Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,746,935 to Allen in view of U.S. Patent 6,271,102 to Brouillette et al. as applied to claims 43 and 46 above, and in further view of U.S. Patent 6,238,269 to Pollard et al.

As applied above to Claims 43 and 46, Allen in view of Brouillette teaches the method of the invention substantially as claimed, but does not teach sand drilling for the claimed removing step.

Pollard et al. teach that it is known in the art of forming ink feed slots in an printhead substrate to use abrasive jet machining otherwise known as drilling or sand blasting (sand drilling) to form the slot in the substrate. (Col. 1, Line 62- Col. 2, Line 4)

It would have been obvious to one of ordinary skill in the art at the time of invention to form the slots using either sand drilling as taught by Pollard et al. as a matter of substituting equivalents known for the same purpose. See MPEP 2144.06.

Note that Brouillette also teaches that other methods of cutting besides sawing are suitable for the second removing step and would be expected to have the same advantages. (Col. 5, Lines 55-56)

Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,746,935 to Allen in view of U.S. Patent 6,271,102 to Brouillette et al. as applied to claims 43 and 46 above, and in further view of U.S. Patent 5,658,471 to Murthy et al.

As applied above, Allen in view of Brouillette teaches the method of the invention substantially as claimed, but does not teach the use of etching including wet etching to form the ink-jet feed slot in the semiconductor substrate.

Murthy et al. teach that an ink-jet feed slot may be partially formed in a silicon substrate by anisotropic etching with any known anisotropic etchant. (Col. 1, Lines 42-44, and Col. 6, Lines 29-32)

It would have been obvious to one of ordinary skill in the art at the time of invention to perform the removing process to form the semiconductor slot using a wet etching as taught by Murthy.

Since Murthy teaches that anisotropic wet etching is a suitable method for forming a slot partially through a silicon printhead substrate to form an ink-jet feed slot, one of ordinary skill in the art would have been motivated at the time of invention to form the feed slot of Allen in view of Brouillette using wet etching as a matter of substituting equivalents known for the same purpose.

(11) Response to Argument

Appellant has argued that there is no motivation to combine Allen with Brouillette.

The argument is not persuasive because Brouillette provides motivation to form the slot of Allen using a two-sided technique. Brouillette teaches for example that entrance cuts are cleaner and stronger than exit cuts. This advantage is well known in the general art of sawing with a circular blade, but the examiner has provided an even more specific reference (Brouillette) in the semiconductor art that teaches the advantage of a two-sided saw cut in a silicon semiconductor substrate, the same substrate that is cut with a saw in Allen.

Appellant has argued that Brouillette has nothing to do with slots or forming slots through a substrate. In support of this argument, Appellant points out that Brouillette performs dicing which divides a wafer into dies.

Appellant is incorrect. Brouillette is clearly related to slot formation, as illustrated in Figure 1 of Brouillette, for example. Dicing a wafer is a slot formation process in which sidewalls and endwalls are formed during the cutting process as illustrated. However, even if this were not the case, Brouillette is directly relevant to Allen since both references are concerned with forming a cut entirely through a silicon semiconductor substrate using a rotary saw blade. Appellant has provided no argument or reasoning explaining why the advantages two-sided cutting (clean, strong cuts) as disclosed in Brouillette would not apply to the cuts made in Allen.

Appellant has argued (Page 8 of Arguments) "*The office contends that motivation exists to combine the references because Brouillette discloses that chips flexed in bending...*"

Appellant is incorrect. The Examiner did not use the above citation from Brouillette to provide motivation in any Office Action. In fact, Appellant introduced the citation from Col. 1, Lines 45-48 of

Brouillete in the response filed 10/5/04. Nevertheless, the citation in context only teaches that the edges formed by prior art methods of one-sided cutting have damage that reduces the strength of the final product.

Appellant has argued that since Allen does not teach that there are substrate strength problems, and teaches that the printhead has decreased complexity and extended lifetime; there is no reason for the skilled artisan to research other slot forming methods.

The argument is unpersuasive. Since Allen teaches forming a slot through a silicon substrate with a saw blade the skilled artisan would of course be motivated to perform the slot forming process using the best available slot forming methods. The fact that Allen teaches an "extended lifetime" is irrelevant. The "extended lifetime" and other advantages of Allen's printhead are unrelated to the slot forming technique. Simply because an invention is improved in one way does not mean that it is precluded from other improvements.

Appellant has argued that there is no reasonable expectation of success since there is no evidence that beveled or stepped cuts would be successful or desirable in proximity to Allen's ink slot.

The argument is not persuasive to overcome the rejection. First, Brouillete teaches beveled and step cuts as possible "variations" enabled by the two-sided cutting process. The advantages of a two-sided cutting technique do not rely on these variations. Second, even if the variations of stepped and beveled cuts are considered relevant to the formation of Allen's ink slot, as suggested by Appellant, the use of beveled edges is known to be well suited to the formation of ink slots in an ink-jet printhead substrate. See Figures 1D-1G of U.S. Patent 5,658,471 to Murthy et al. cited herein and in the previous Office Actions.

Appellant has argued that Allen does not describe teach or suggest a slot having endwalls that meet at an angle greater than or equal to ninety degrees relative to the substrate.

The argument is unpersuasive because Allen illustrates that an ink feed cylinder or slot has vertical walls. The limitation of endwalls as broadly claimed by appellant and as defined by Appellant (See the angle shown in Figure 8E and 11E of Appellants Drawings) reads on a simple vertical slot (180 degrees)

Note that Brouillette also illustrates endwalls having first and second portions that meet at an angle greater than or equal to ninety degrees. See Figures 7A-7C of Brouillette.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Roberts Culbert

February 10, 2005

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